



Unilateral congenital elbow luxation in a Cavalier King Charles Spaniel

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Abstract — A 7-week-old, intact female, Cavalier King Charles Spaniel was evaluated for nonweight bearing lameness of the right forelimb. Type III unilateral congenital elbow luxation was diagnosed radiographically. After surgical reduction, temporary placement of a transarticular pin, and external splinting of the joint, full weight bearing was achieved. Radial head subluxation persisted.

Résumé — Luxation congénitale unilatérale du coude chez un Épagneul cavalier King Charles. Une femelle de 7 semaines, non stérilisée, Épagneul cavalier King Charles a été évaluée pour une boiterie de non-appui au membre antérieur droit. Une luxation congénitale unilatérale du coude de type III a été diagnostiquée par radiographie. Après réduction chirurgicale, insertion d'une tige trans-articulaire temporaire et pose d'une attelle du côté externe de l'articulation, un appui total a été obtenu. La subluxation de la tête du radius a persisté.

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A 7-week-old, intact female, Cavalier King Charles Spaniel puppy was presented for right forelimb lameness. The owner noted that the puppy's right forelimb had appeared abnormal since birth and that the puppy had never been able to use the limb properly. Two other puppies were born in the same litter, one stillborn. The surviving male littermate was apparently healthy. The dam had whelped 1 previous litter of healthy puppies by a different sire.

On physical examination, the puppy had a nonweight bearing lameness of the right forelimb. The right forelimb was held in partial flexion, with pronation of the antebrachium and a varus deviation of the paw. Palpation of the right elbow joint revealed lateral displacement of the radius/ulna relative to the humerus. The caudomedial aspect of this joint was fluctuant, consistent with joint effusion. Crepitus was present on manipulation of the right elbow joint, and the range of motion was reduced in both extension and flexion. No pain was noted on manipulation of the joint. The left forelimb was normal on palpation. No other abnormalities were noted on physical examination. Packed cell volume, total protein, blood glucose, and specific gravity were normal.

Radiographic examination of the right elbow joint confirmed the diagnosis of elbow luxation. All bone

elements comprising the right elbow joint appeared to be present (epiphyses and diaphyses-metaphyses) and were relatively normal in size and shape. A small ovoid opacity was seen caudal to the medial epicondyle of the humerus on the lateral view. Its origin was uncertain. The radius and ulna of the right elbow joint were laterally displaced. Clinical history and radiographic evidence were consistent with a diagnosis of type III congenital elbow luxation (CEL).

Closed reduction of the right elbow joint was unsuccessful. Surgical stabilization was performed by open reduction and placement of a transarticular pin. After premedication with midazolam (Vesed; Roche Pharmaceuticals, Nutley, New Jersey, USA), 0.2 mg/kg bodyweight (BW), IM, and oxymorphone (Numorphan; DuPont Pharmaceuticals, Monati, Puerto Rico, USA), 0.1 mg/kg BW, IM, anesthesia was induced with propofol (Rapinovet; Schering Canada, Pointe Claire, Quebec), 2 mg/kg BW, IV, and maintained with 1.25% isoflurane (Aerrane; Baxter Corporation, Mississauga, Ontario) in 1.0 L/min oxygen. The right forelimb was clipped and prepared aseptically. A right brachial plexus nerve block was performed using bupivacaine (1).

A lateral incision was made on the right elbow joint extending from the supracondylar crest over the lateral epicondyle to the proximal radius. The subcutaneous tissues were incised and bluntly dissected to expose the lateral surface of the elbow. The anconeus muscle and the joint capsule were incised to enter the joint. The ulna was manually reduced and held in reduction with the joint flexed to approximately 110 degrees. A 0.045 inch diameter (1.14 mm) pin was driven caudocranial through the semilunar notch of the ulna and seated into the distal part of the medullary cavity of the humerus by using a mini driver. The pin was cut to leave 1.5 to 2.0 cm

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extending outside the ulna. Closure was performed in 3 layers.

Immediate postoperative radiographs were taken while the puppy was under inhalational anesthesia. Lateral and anteroposterior (AP) views of the right elbow joint demonstrated that the transarticular pin was malpositioned; it was angled in the humerus such that it crossed the distal diaphysis and exited the humerus medially. The ulna and radius had relaxed laterally.

The puppy was returned to surgery and the transarticular pin was removed. The right elbow joint was manually reduced, as previously described, and the 0.045 transarticular pin was replaced. A three-layer closure was performed.

Postoperative radiographs demonstrated improved pin placement. The pin now passed proximally through the lateral humeral condyle but not up the medullary canal of the humeral diaphysis. Alignment of the right elbow joint was improved, although the radius remained laterally subluxated, with 50% of its articular surface located lateral to the humerus.

Postoperatively, a spica splint with a rigid metal bar incorporated along its lateral aspect was applied to the right forelimb, extending from the axilla to the digits. The splint functioned to support the surgical reduction of the joint and to prevent motion in the joint during the immediate postoperative period. The owner was advised to minimize the puppy's activity until the transarticular pin had been removed. Meloxicam (Metacam; Boehringer Ingelheim Canada, Burlington, Ontario), 0.1 mg/kg BW, PO, q24h, for 3 wk was prescribed for pain control.

Seven days after surgery, the puppy was presented for splint reapplication. The original splint had loosened, and the stabilizing bar had fallen out. The surgical site was healing well, and the transarticular pin was protruding approximately 1.5 mm from the distal end of the incision. Radiographic evaluation of the joint was not performed at this time. The splint was reapplied, and the puppy was sent home.

Eleven days postoperatively, the right elbow joint was examined radiographically. No obvious alteration of the surgical implant was noted, although direct comparison with the postoperative radiographs was difficult due to the different limb positions. The radial head remained laterally subluxated. The transarticular pin was removed under inhalation anesthesia after radiographic assessment. Options considered at this time included another surgical attempt at reducing the radial head, physical therapy, or splinting of the joint combined with physical therapy. The owners declined further surgical treatment and elected to place the right elbow joint in a spica splint in slight flexion for an additional week in order to encourage stability of the joint.

Ten days after transarticular pin removal, the puppy was examined and the spica splint was removed. Marked muscle atrophy of the right forelimb, and decreased range of motion of the right elbow joint in both flexion and extension were noted. Pain was elicited when the right elbow was flexed. Passive range of motion and stretching exercises of the right elbow joint for 3 to 5 min 3 times per day, combined with cold compresses to reduce inflammation in the 1st wk, then warm compresses to

encourage circulation in the following weeks, were recommended.

Four months after surgery, the owner reported that the puppy was bearing full weight on the right forelimb. The range of motion in the right elbow joint was uninhibited on flexion, but limited in extension, causing the puppy to walk with a limp. As the puppy was bearing weight on the affected limb, which did not seem to be painful, the owner declined further surgical repair of the joint, despite the lameness.

This is the first reported case of CEL in a Cavalier King Charles Spaniel. This condition has occasionally been reported in other breeds (2–6), with smaller breeds and males more commonly affected (2).

Congenital elbow luxation typically presents as a non-weightbearing lameness in one or both forelimbs, which is first noticed when the puppy is 3 to 6 wk old. Three forms of elbow luxation are recognized: humeroradial (type I), humeroulnar (type II), and combined humeroradial and humeroulnar (type III) (2). Humeroulnar luxations are most common (2). Diagnosis of CEL is based on early onset of clinical signs and radiographs; it must be differentiated from developmental elbow luxation (DEL). The most common cause of DEL, which also presents as lameness in young dogs, is premature closure of the distal growth plate of the ulna (6).

Because of the possible hereditary nature of CEL (4), it is important to recognize the breeds and lineage of affected dogs. In this case, the history of the sire was unknown. One littermate of this puppy was stillborn, although the cause was not determined. In one study, it was determined that in 2 of 6 cases of congenital elbow luxation, the remaining littermates died shortly after birth. One case involved a dam that underwent surgical repair and radiography of a fractured femur during the first trimester of pregnancy (7), suggesting that maternal stress or teratogenic effects of drugs or radiation may play a role in some cases. Other congenital abnormalities, including ectrodactyly (3), polyarthrodysplasia (5), patellar luxation, hydrocephalus, retained testicle, deformed tail (7), and avascular necrosis of the femoral head (3), have been reported in conjunction with CEL. Continued study of newly reported CEL cases with particular attention to history and pedigree is needed to support or disprove the heritability of this condition. Until further studies have been done, it is advisable that dogs with congenital elbow luxation are not bred.

Several methods have been described for the treatment of CEL. The elbow luxation may be reduced in an open or closed fashion. Percutaneous temporary placement of a transarticular pin (TTP) after closed reduction of the congenitally luxated joint has been reported to result in normal elbow function, with no development of degenerative joint disease or epiphyseal injury postoperatively (6). In this case, the affected elbow joint was nonreducible by the closed technique. Surgical exposure of the joint allowed for manual reduction and proper TTP placement. Despite good elbow function, subluxation of the humeroulnar and humeroradial joints have been noted in some cases managed by TTP (2,6). Subluxation of the humeroradial joint was a postoperative complication in this case. A modified external fixator technique, in which heavy rubber bands are employed concurrently with

transcondylar pins, has been described as a successful method for closed reduction and stabilization of CEL (7).

Reduction and stabilization of congenital elbow luxations must be performed as early as possible. If the surgical repair had been delayed in this case, secondary degenerative and remodeling changes in the affected elbow joint would have occurred, making surgical repair more difficult and invasive. In many puppies under 4 mo of age, CEL can be repaired by closed reduction and percutaneous fixation, whereas in animals older than 4 to 5 mo of age, more invasive open reduction and stabilization techniques are required (8).

The goal of surgical repair of congenital elbow luxation is normal function of the affected limb, not full joint reconstruction (2). In this case, temporary transarticular pinning and physical therapy yielded satisfactory results. Normal weight bearing of the right forelimb was attained, but the radius remained subluxated, and normal extension of the joint was not achieved 4 mo postoperatively. As a result, the puppy continued to have an appreciable lameness and a reduced angle through the elbow joint, despite surgery. More aggressive repair of the luxated elbow joint, including medial imbrication, lateral capsulotomy, desmotomy of the lateral collateral ligament, anconeus myotomy, medial and distal transposition of the olecranon process on the ulna, ulnar osteotomy, and radioulnar synostosis has been reported (8), but it is rarely required in puppies younger than 4 mo of age. More aggressive repairs have reported similar outcomes to the TTP technique, with varying degrees of postoperative malarticulation and subluxation. In this case, the affected puppy was 7 wk old, and did not have secondary degenerative or remodeling changes in the radius, ulna, or humerus.

Subluxation of the radius after surgery despite proper positioning of the ulna suggests that the medial collateral ligament, the annular ligament of the elbow, or both, were abnormal. It has been reported that the medial collateral ligament can be absent in some cases of CEL (5). Radial subluxation may have been prevented by the placement of a small Steinmann pin between the radius

and ulna, as has previously been described (7). The small size of the patient and the presence of the transarticular pin made this option technically difficult. The proximal growth plate of the radius in this age of puppy is open, which may also cause problems related to differential growth rates of the radius relative to the ulna, if the 2 structures are fixed together with a pin. This would lead to further joint incongruity and increased degenerative changes. Medial imbrication of the joint capsule may have been of some benefit in providing additional stabilization of the reduction; however, this would have required another surgical incision on the medial aspect of the joint. The postsurgical application of a spica splint provided adequate stabilization and an acceptable outcome in this patient.

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